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# PATENT SPECIFICATION

DRAWINGS ATTACHED

1,146,141

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## COMPLETE SPECIFICATION

## Improvements in or relating to the Production and Application of Coatings

We, TRENTESAUX-TOULEMONDE, a French body corporate of 200 rue du Pont Rompu, Tourcoing, Nord, France do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method and apparatus for imparting a glossy coating to a backing material.

In order to obtain a glossy coating on backing material such as fabrics, cardboard, paper and films, recourse has been had to depositing thereon varnishes or synthetic resins by different means. All depositing techniques have been employed, including coating, spraying, and brushing on, as well as pressing on a prefabricated glossy film.

When, however, it is required to obtain such a coating in continuous fashion on a backing travelling at high speed through a depositing machine, the choice of usuable materials becomes restricted to those having a very short setting time. Further, the materials most often used are thermoplastic materials which, softened under heat, are rendered glossy by contact with a smooth surface (as in calendering, for example), or cooled by contact with a shiny surface. On the other hand, such materials produce glossy coverings of less depth and gloss than certain other synthetic plastics which have longer setting times but cannot be employed for such a depositing technique, because they are slow-setting.

According to the invention there is provided a method of imparting a gloss coating to a backing material comprising applying a coating and a flexible material having a smooth surface to said backing material so that the coating lies between the backing material and the flexible material, allowing said coating to harden and separating the flexible material from the coated backing material, wherein said coating is a slow-setting adhesive which initially adheres to both the backing material and the flexible material but whose adhesion to the flexible material diminishes as the coating hardens, the hardening being by chemical action, and wherein said flexible material is chemically incompatible with said coating.

If both surfaces of the flexible material are smooth it may be used to impart a coating to two backing materials, i.e. by sandwiching the flexible material between two backing materials and their adhesive coatings.

Alternatively, if the uncoated surface of the backing material is smooth and chemically incompatible with the adhesive forming the coating it may be used as the flexible material in the coating of a second backing material, or by rolling up the coated backing material the uncoated surface may be used as the flexible material to impart a smooth surface to the coating.

Furthermore, if the backing material is coated on both surfaces the flexible material may comprise either one piece of flexible material which is doubled over or two separate pieces of flexible material.

The adhesive coating may alternatively be applying to the backing material or if the adhesive comprises two or more components, e.g. resins one component may be applied to the flexible material while the other or others are applied to the backing material. The flexible material is then brought into con-

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tact with the backing material so that all components of the adhesive are combined.

Any convenient technique may be used to apply the adhesive coating to the backing material or the flexible material, e.g. coating, brushing on, spraying, flexography or a transfer technique similar to that employed in rotogravure. The coating may either be continuous or cover only specific areas of the backing material or flexible material.

The flexible material may be embossed or filigreed if required and since the adhesive coating hardens while in contact with the flexible material, the pattern of the surface of the flexible material will be reproduced on the surface of the coating when the flexible material is detached. This pattern will be faithfully reproduced on the surface of the adhesive coating since the adhesive, due to being slow to harden remains soft for sufficient time to spread uniformly by creepage and more particularly by pressure if the backing material, adhesive coating and flexible material are rolled up and stored for the required time. It is thus all the more desirable that the adhesive coating should adhere to the flexible material until it has hardened.

After the adhesive coating has hardened it adheres strongly to the backing material whereas adhesion to the flexible material has diminished until it is possible to separate the flexible material from the coated backing material without difficulty.

The adhesive coating preferably comprises at least two constituents which react with one another, in the pressure of a solvent or dispersing agent, to form a glossy coating.

One of the constituents can be, for example, a cross-linkable polyester.

The adhesive coating may be prepared by mixing a first constituent consisting of saturated or un-saturated polyesters comprising reactive groups in solution and a second constituent consisting of substances of low molecular weight in solution which react with said reactive groups. Said second constituent is preferably a di- or tri-functional monomer which reacts in the cold state with said polyester.

More specifically, use may be made of the constituents referred to precedingly, i.e. of an un-saturated polyester resin, which can be diluted in styrene, and the cross-linking can be obtained in known manner by means of peroxides or hydroxides and accelerated by means of naphthenate or cobalt octoate, or else with amines. One of the constituents, the polyester resin for instance, can be applied on to the backing material to be covered, while the cross-linking agents, which are diluted in a nitrocellulose varnish or in an unsaturated polyester not containing styrene, can be applied to the flexible material.

Use can also be made of a phenol resin or urea-based varnish capable of cross-linking under the action of an acid such as hydrochloric acid or paratoluenesulfonic acid.

When coating materials which are intended for foodstuffs or for domestic or other applications, and which are in contact with foods and the like, it is necessary to choose constituents which will ensure compliance with the legal prescriptions.

In this particular case it is possible to use a solution of saturated polyesters containing reactive groupings, and as the second constituent a solution or di- or tri-functional monomers which react in the cold condition with the first constituent, in a proportion such that after said second constituent has been incorporated in the mixture all the monomers are fully combined with the polyesters. Advantageous the adhesive coatings are prepared from materials which remain odourless, tasteless and non-toxic when chemically combined to form the coating, thereby enabling their use for manufacturing flexible packaging materials for foodstuffs and domestic uses. Such materials may be printed or covered with a glossy and attractive coating which is weatherproof and impervious to heat and the usual chemical agents, and which protects any imprints on the backing material against the same attacking agents.

Thus, the adhesive coating is made of constituents which, once combined, will harden with time by chemical action, the time varying from a few hours to a few days according to the formulation adopted.

The surface of the flexible material, as reproduced on the hardened adhesive coating, is unalterable to a point such that heat has no discernible effect until actual carbonization of the coating begins.

The method hereinbefore described can be used to obtain permanent coatings such as on textiles, paper, films and sheet metal.

The backing material may receive beforehand a coating of an imprint. It may be laminated in order to enhance its mechanical properties, make it waterproof, or impart any other requesite property to it.

The flexible material must be chosen both for its mechanical properties and for its surface properties, such that the adhesive coating adheres thereto perfectly but that the coating once set is non-adhesive.

Suitable materials are those having a surface made up of substances having little or no polarity.

This property can, for example, be obtained if the flexible material is a polyolefin-based film or a film coated with such substances, e.g., polyethylene or polypropylene.

Though devoid of polarity, such substances exhibit strong initial adhesion to the flexible material, and gradually lose their adhesive property in respect of the flexible material as the chemical hardening proceeds.

More specifically, a film of molecularly

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orientated polypropylene may be used in which case the smooth and glossy surface condition of such a material will be transferred to the adhesive coating of the backing material after the adhesive coating has hardened chemically. A bi-orientated polypropylene film will impart a particularly smooth and glossy surface to the adhesive coating. However it should be remembered that if the surface of such an oriented polypropylene film is treated by oxidation, as is customary in order to impart to such a surface the ability to receive and retain an imprint, the adhesive substance in question would continue to adhere to the oxidized surface even after said substance had fully hardened, thereby making it impossible to separate the flexible material from the backing material.

Alternatively, the flexible material may be chosen according to the surface condition it is desired to reproduce on the adhesive coating and may be smooth, glossy, embossed, stamped, filigreed, or otherwise.

The flexible material may, if desired be covered with a material e.g. printed matter having very limited adhesion.

During the hardening of the adhesive coating, this material passes through the adhesive coating, with the result that subsequent to hardening of the coating the material is transferred on to the surface of the backing material, and the flexible material, which is then devoid of the material can be separated without detaching the material, i.e. the printed matter.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawing, in which;

Figure 1 shows diagrammatically the layout of an apparatus suitable for providing a glossy coating one one surface of a backing material such as paper; and

Figure 2 shows an alternative arrangement for such a coating apparatus, in which symmetrical use is made of a flexible material.

Referring first to Figure 1, the apparatus shown thereon comprises a paper spool unwinding station 1, from which a paper strip 2 for use as the backing material passes over intermediate rolls 3 and 4 and thence to a station 5 where the adhesive coating substance is applied. At station 5 paper strip 2 passes beneath an intermediate roll 6, opposite which is positioned a sizing roll 7 which dips partly into a tank 8 containing the adhesive coating substance in the liquid state. The gap between rolls 6 and 7 is adjusted so as to obtain the required thickness of coating on strip 2.

Having been thus coated, the paper strip 2 passes over an upper intermediate roll 9, then over a roll 10 located at the same level, with only its uncoated surface in contact with rolls 9 and 10. Strip 2 is then caused to pass between a pair of calendering rolls 11 and 12, with its uncoated surface in contact with roll 11.

In contact with roll 12 is a strip 13 of the flexible material fed from an unwinding spool 14. Strip 13 is applied against the adhesive coating with the desired pressure, and its surface in contact therewith is exceptionally smooth in order to impart the desired glossiness. The strip 2 and the strip 13, joined thus together, follow the path 15 and reach the station where they are coiled on to a spool 16.

Referring now to the alternative embodiment shown in Figure 2, two symmetrical stations are provided for applying the adhesive coating, and in this arrangement like parts are designated by like numerals followed by the letters a and b. At a first calendering station consisting of rolls 11a and 12a, the paper strip of backing material 2a with its coating thereon receives the strip 13a of the flexible material, while at a second calendering station equipped with rolls 11b and 12b the apparent face of strip 13a is used, and a corresponding saving is achieved.

By way of an alternative arrangement, the dot-dash line 17 shows the manner in which paper strip 2b could be applied against strip 13a at the same time as strip 2a at the first calendering station, thus dispensing with the need for a second calendering station.

The strips of backing material may be made of fabric, cardboard, paper, film, or any other convenient flexible material.

If the adhesive coating comprises two constituents, one may be applied to the strip of backing material, while the other can be applied to the smoothing strip 13 or 13a, which is accordingly caused to travel through a suitable coating station (not shown).

In such an arrangement, the adhesive coating is applied to one surface only of the strip forming the backing material, but it is to be clearly understood that both surfaces could be coated if desired, using a single strip of the flexible material.

In the arrangement described hereinabove, the coating is done by means of transfer rolls, but manifestly other techniques may be employed, as already indicated.

In the course of its travel, the coated strip of backing material follows a path permitting evaporation of possible solvents or dispersing media before it contacts the strip of the flexible material, but it will be manifest that this evaporation could continue subsequently. In any event, the time for which a spool is stored must be sufficient for the coating substances to have ample time to eliminate the possible solvents or dispersing media and to harden by a curing, cross-linkage, or other chemical process, prior to ultimate utilization, which is preceded by the detaching of the flexible material from the coated strip forming

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the backing material to permit its possible re-utilization.

The adhesive coating may be provided uniformly over the entire surface of one of the faces of the backing material or only on selected areas thereof, in which case the coating can be carried out by rotogravure or similar techniques.

Again, the adhesive coating may be applied to the appropriate surface of the flexible material only, or to both surfaces thereof.

Special effects can be obtained by using an embossed or filigreed strip of flexible material.

Lastly, where only one surface of the strip of backing material is to be coated, the other surface may be processed in order to impart to it the required smooth aspect over either the entire surface, or on selected areas thereof, provided that no part of the latter-mentioned surface has any affinity for the adhesive coating, said other surface being applied on this adhesive coating as soon as the strip of backing material is wound in the form of a spool.

WHAT WE CLAIM IS:—

1. A method of imparting a glossy coating to a backing material comprising applying a coating and a flexible material having a smooth surface to said backing material so that the coating lies between the backing material and the flexible material, allowing said coating to harden and separating the flexible material from the coated backing material, wherein said coating is a slow-setting adhesive which initially adheres to both the backing material and the flexible material but whose adhesion to the flexible material diminishes as the coating hardens, the hardening being by chemical action, and wherein said flexible material is chemically incompatible with said coating.

2. A method as claimed in claim 1, wherein both surfaces of the flexible material are smooth and the flexible material is used to impart a coating to two backing materials.

3. A method as claimed in claim 1, wherein the uncoated surface of the backing material is smooth and chemically incompatible with the adhesive coating and is used as the flexible material in the coating of a second backing material, or by rolling up the coated backing material is used as the flexible material to impart a smooth surface to the coating.

4. A method as claimed in claim 1, claim 2 or claim 3, wherein the flexible material comprises, at least at the surface thereof, a substance having little or no polarity.

5. A method as claimed in claim 4, wherein said substance comprises a polyolefin.

6. A method as claimed in claim 5, wherein said polyolefin is a mono or bi-orientated polypropylene.

7. A method as claimed in any preceding claim, wherein the adhesive coating comprises a solution of a polyester having reactive groups and a solution of a co-reactive substance of low molecular weight.

8. A method as claimed in claim 7, wherein said co-reactive substance is a di- or trifunctional monomer which reacts in the cold state with said reactive polyester, in a proportion such that all the monomer is fully reacted with said polyester when the reaction is complete.

9. A method as claimed in any preceding claim, wherein the flexible material, before being contacted with said adhesive coating, is covered with a material having very limited adhesion which, during the hardening of said adhesive coating, passes through the coating onto the surface of the backing material.

10. A method as claimed in any of claims 1 to 8, wherein the adhesive coating comprises at least one synthetic resin which hardens slowly by curing or cross-linkage.

11. A method as claimed in claim 10, wherein more than one synthetic resin is employed and one of the resins is applied to the flexible material and the other or others is or are applied to the backing material.

12. Apparatus for performing the method of any of claims 1 to 11, comprising backing material and flexible material pay-out stations, a station or stations for applying the adhesive coating to a strip of backing material, a strip of flexible material or to both, at least one station for simultaneously calendering both the strip of backing material and strip of flexible material, a station for winding in the resultant assembly of coated backing material and flexible material, and a station for unwinding said assembly and for stripping off said flexible material.

13. A method for the production of materials having a glossy coating substantially as hereinbefore described with reference to and as illustrated in the acompanying drawings.

14. An apparatus for production of materials having a glossy coating substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

15. Coated materials, when prepared by the method claimed in any of claims 1 to 11 or 13.

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1146141 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

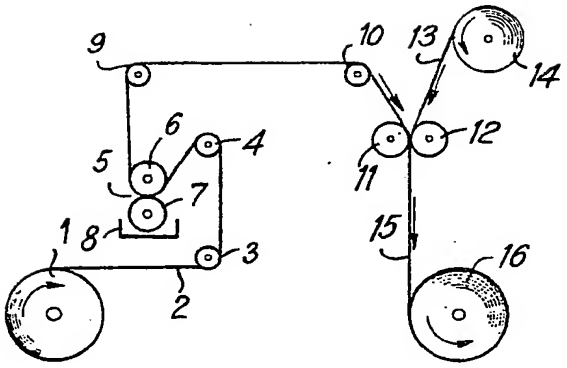
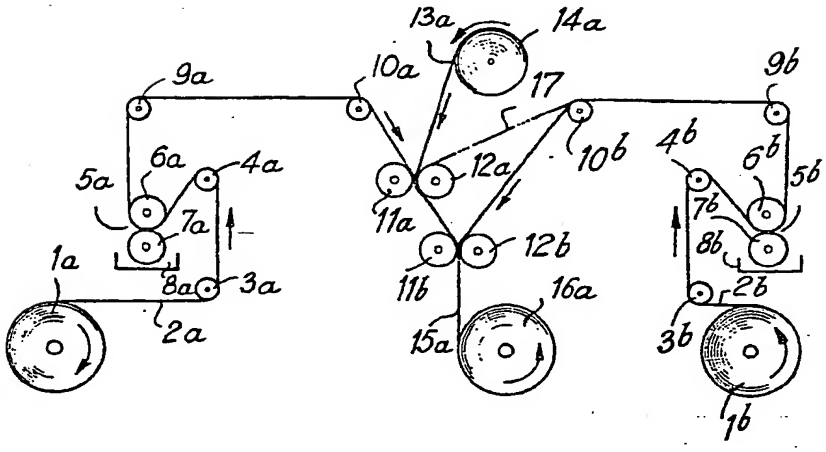



Fig. 1.

Fig.2.

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